



CASH Clients (Saskatoon)
ATTN: Nathan Serbu
Serbu Sand and Gravel
Regina SK S4R 8R4

Date Received: 22-JUL-20
Report Date: 29-JUL-20 09:14 (MT)
Version: FINAL

Client Phone: 306-537-6647

Certificate of Analysis

Lab Work Order #: L2477866
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Other Information: INV COMMENTS: INVOICE PAID IN FULL

Kimberley Head, B.Sc.
Account Manager

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ADDRESS: #819-58th St E., Saskatoon, SK S7K 6X5 Canada | Phone: +1 306 668 8370 | Fax: +1 306 668 8383
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2477866-1 STRAIGHT							
Sampled By: CLIENT on 22-JUL-20 @ 08:00							
Matrix: SOIL							
% Particles > 75um (Coarse/Fine)							
MUST PSA % > 75um	83.8		1.0	%	27-JUL-20	27-JUL-20	R5167774
General Texture Class	Coarse				27-JUL-20	27-JUL-20	R5167774
Available Micronutrients (Cu,Fe,Zn,Mn)							
Copper (Cu)	0.58		0.20	mg/kg	24-JUL-20	24-JUL-20	R5166829
Iron (Fe)	79.9		2.0	mg/kg	24-JUL-20	24-JUL-20	R5166829
Manganese (Mn)	5.90		0.050	mg/kg	24-JUL-20	24-JUL-20	R5166829
Zinc (Zn)	0.95		0.20	mg/kg	24-JUL-20	24-JUL-20	R5166829
Total Available N & NO3-N, NO2-N & NH4							
Available Ammonium-N							
Available Ammonium-N	2.9		1.0	mg/kg	28-JUL-20	28-JUL-20	R5169761
Available Ammonium-N - Calculation							
Total Available Nitrogen	37.8		2.2	mg/kg		28-JUL-20	
Nitrate, Nitrite & Nitrate+Nitrite-N(KCL)							
Nitrite-N	<1.0		1.0	mg/kg	28-JUL-20	28-JUL-20	R5169717
Nitrate+Nitrite-N	34.9		2.0	mg/kg	28-JUL-20	28-JUL-20	R5169717
Nitrate-N	34.9		2.0	mg/kg	28-JUL-20	28-JUL-20	R5169717
Available N, P, K and S							
Available Nitrate-N							
Available Nitrate-N	41.9		1.0	mg/kg	24-JUL-20	24-JUL-20	R5166835
Available Sulfate-S							
Available Sulfate-S	17.9		3.0	mg/kg	24-JUL-20	24-JUL-20	R5166791
Plant Available Phosphorus and Potassium							
Available Phosphate-P	12.6		2.0	mg/kg	27-JUL-20	27-JUL-20	R5167929
Available Potassium	131		20	mg/kg	27-JUL-20	27-JUL-20	R5167929
Detailed Salinity for BC and SK Regs							
% Saturation							
% Saturation	33.1		1.0	%	24-JUL-20	25-JUL-20	R5167032
Ca,K,Mg,Na in Soil (Paste) by ICPOES							
Calcium (Ca)	139		5.0	mg/L		26-JUL-20	R5167275
Magnesium (Mg)	53.5		5.0	mg/L		26-JUL-20	R5167275
Potassium (K)	32.7		5.0	mg/L		26-JUL-20	R5167275
Sodium (Na)	28.2		5.0	mg/L		26-JUL-20	R5167275
Chloride in Soil (Paste) by Colorimetry							
Chloride (Cl)	41		20	mg/L		25-JUL-20	R5167396
Conductivity in Soil (Paste) by Meter							
Conductivity Sat. Paste	1.33		0.010	dS/m		25-JUL-20	R5167099
Salinity in mg/kg							
Chloride (Cl)	13.7		6.6	mg/kg		27-JUL-20	
Calcium (Ca)	46.0		1.7	mg/kg		27-JUL-20	
Magnesium (Mg)	17.7		1.7	mg/kg		27-JUL-20	
Potassium (K)	10.8		1.7	mg/kg		27-JUL-20	
Sodium (Na)	9.3		1.7	mg/kg		27-JUL-20	
Sulfur (as SO4)	52.7		2.0	mg/kg		27-JUL-20	
Sodium Adsorption Ratio (Sat. Paste)							
SAR	0.51		0.10	SAR		26-JUL-20	
Sulphate (SO4)							
Sulfur (as SO4)	159		6.0	mg/L		26-JUL-20	R5167275
pH in Saturated Paste							
pH in Saturated Paste	7.75		0.10	pH		25-JUL-20	R5167099

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2477866-2 MIXED							
Sampled By: CLIENT on 22-JUL-20 @ 08:00							
Matrix: SOIL							
% Particles > 75um (Coarse/Fine)							
MUST PSA % > 75um	77.6		1.0	%	27-JUL-20	27-JUL-20	R5167774
General Texture Class	Coarse				27-JUL-20	27-JUL-20	R5167774
Available Micronutrients (Cu,Fe,Zn,Mn)							
Copper (Cu)	0.61		0.20	mg/kg	24-JUL-20	24-JUL-20	R5166829
Iron (Fe)	24.5		2.0	mg/kg	24-JUL-20	24-JUL-20	R5166829
Manganese (Mn)	3.80		0.050	mg/kg	24-JUL-20	24-JUL-20	R5166829
Zinc (Zn)	2.66		0.20	mg/kg	24-JUL-20	24-JUL-20	R5166829
Total Available N & NO3-N, NO2-N & NH4							
Available Ammonium-N							
Available Ammonium-N	1.3		1.0	mg/kg	28-JUL-20	28-JUL-20	R5169761
Available Ammonium-N - Calculation							
Total Available Nitrogen	136		5.1	mg/kg		28-JUL-20	
Nitrate, Nitrite & Nitrate+Nitrite-N(KCL)							
Nitrite-N	<1.0		1.0	mg/kg	28-JUL-20	28-JUL-20	R5169717
Nitrate+Nitrite-N	135	DLHC	5.0	mg/kg	28-JUL-20	28-JUL-20	R5169717
Nitrate-N	135	DLHC	5.0	mg/kg	28-JUL-20	28-JUL-20	R5169717
Available N, P, K and S							
Available Nitrate-N							
Available Nitrate-N	136	DLHC	5.0	mg/kg	24-JUL-20	24-JUL-20	R5166835
Available Sulfate-S							
Available Sulfate-S	56.8		3.0	mg/kg	24-JUL-20	24-JUL-20	R5166791
Plant Available Phosphorus and Potassium							
Available Phosphate-P	112	DLHC	10	mg/kg	27-JUL-20	27-JUL-20	R5167929
Available Potassium	1540	DLHC	100	mg/kg	27-JUL-20	27-JUL-20	R5167929
Detailed Salinity for BC and SK Regs							
% Saturation							
% Saturation	44.2		1.0	%	24-JUL-20	25-JUL-20	R5167032
Ca,K,Mg,Na in Soil (Paste) by ICPOES							
Calcium (Ca)	166		5.0	mg/L		26-JUL-20	R5167275
Magnesium (Mg)	89.4		5.0	mg/L		26-JUL-20	R5167275
Potassium (K)	1620		5.0	mg/L		26-JUL-20	R5167275
Sodium (Na)	148		5.0	mg/L		26-JUL-20	R5167275
Chloride in Soil (Paste) by Colorimetry							
Chloride (Cl)	651		20	mg/L		25-JUL-20	R5167396
Conductivity in Soil (Paste) by Meter							
Conductivity Sat. Paste	6.80		0.010	dS/m		25-JUL-20	R5167099
Salinity in mg/kg							
Chloride (Cl)	288		8.8	mg/kg		27-JUL-20	
Calcium (Ca)	73.3		2.2	mg/kg		27-JUL-20	
Magnesium (Mg)	39.5		2.2	mg/kg		27-JUL-20	
Potassium (K)	716		2.2	mg/kg		27-JUL-20	
Sodium (Na)	65.4		2.2	mg/kg		27-JUL-20	
Sulfur (as SO4)	181		2.7	mg/kg		27-JUL-20	
Sodium Adsorption Ratio (Sat. Paste)							
SAR	2.30		0.10	SAR		26-JUL-20	
Sulphate (SO4)							
Sulfur (as SO4)	409		6.0	mg/L		26-JUL-20	R5167275
pH in Saturated Paste							
pH in Saturated Paste	7.77		0.10	pH		25-JUL-20	R5167099

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-PASTE-COL-CL	Soil	Chloride in Soil (Paste) by Colorimetry	CSSS, APHA 4500-Cl E
A soil extract produced by the saturated paste extraction procedure is analyzed for Chloride by Colourimetry.			
EC-PASTE-CL	Soil	Conductivity in Soil (Paste) by Meter	CSSS ch.15
This analysis is adapted from the methods outlined in "Soil Sampling and Methods of Analysis" by M. Carter. In summary, 200 to 500 grams of sample is extracted for a minimum of 4 hours with an amount of deionized water as required to create a saturated paste. The sample is then filtered or centrifuged and decanted to produce an extract that is ready for analysis. Conductivity is determined using a conductivity electrode.			
ETL-N-TOT-AVAIL-SK	Soil	Available Ammonium-N - Calculation	Soil Methods of Analysis (1993) CSSS
MET-PASTE-ICP-CL	Soil	Ca,K,Mg,Na in Soil (Paste) by ICPOES	CSSS CH15/EPA 6010D
A soil extract produced by the saturated paste extraction procedure is analyzed for Calcium, Magnesium, Potassium, Sodium by ICPOES.			
METAL-DTPA-SK	Soil	Available Micronutrients (Cu,Fe,Zn,Mn)	CSSS 1993 (11.3 AND 11.4)
Plant available micronutrients are extracted from soil using 0.005 M DTPA. Cu, Fe, Mn and Zn in the extract are determined by ICP-OES.			
N2/N3-AVAIL-KCL-SK	Soil	Nitrate, Nitrite & Nitrate+Nitrite-N(KCL)	CSSS (2008) 6.2-6.3
Plant available nitrate and nitrite are extracted from the sample with 2N KCl. Nitrate and Nitrite in the filtered extract are determined colorimetrically by Technicon auto-analyzer or flow injection analyzer at 520 nm.			
NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS Carter 6.2 / Comm Soil Sci 19(6)
Ammonium (NH4-N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.			
NO3-AVAIL-SK	Soil	Available Nitrate-N	Alberta Ag / APHA 4500 NO3F
Available Nitrate and Nitrite are extracted from the soil using a dilute calcium chloride solution. Nitrate is quantitatively reduced to nitrite by passing of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is measured at colorimetrically at 520nm.			
PH-PASTE-CL	Soil	pH in Saturated Paste	CSSS Ch. 15
A soil extract produced by the saturated paste extraction procedure is analyzed by pH meter.			
PO4/K-AVAIL-SK	Soil	Plant Available Phosphorus and Potassium	Comm. Soil Sci. Plant Anal, 25 (5&6)
Plant available phosphorus and potassium are extracted from the soil using Modified Kelowna solution. Phosphorous in the soil extract is determined colorimetrically at 880 nm, while potassium is determined by flame emission at 770 nm.			
PSA-MUST-SK	Soil	% Particles > 75um (Coarse/Fine)	ASTM D422-63-SIEVE
An air-dried sample is reduced to < 2 mm size and mixed with a dispersing agent (Calgon solution). The sample is washed through a 200 mesh (75 m) sieve. The retained mass of sample is used to determine % sand fraction.			
Reference: ASTM D422-63			
SAL-MG/KG-CALC-CL	Soil	Salinity in mg/kg	Manual Calculation
SALINITY-INTCHECK-CL	Soil		CSSS 18.4-Calculation
SAR-PASTE-CALC-CL	Soil	Sodium Adsorption Ratio (Sat. Paste)	CSSS 15.4.4-Calculation
Sodium Adsorption Ratio (SAR) is calculated as per "Soil Sampling and Methods of Analysis" by M. Carter.			
SAT-PCNT-N-CL	Soil	% Saturation	CSSS Ch. 15
Saturation Percentage (SP) is the total volume of water present in a saturated paste (in mL) divided by the dry weight of the sample (in grams), expressed as a percentage, as described in "Soil Sampling and Methods of Analysis" by M. Carter.			
SO4-AVAIL-SK	Soil	Available Sulfate-S	REC METH SOIL ANAL - AB. AG(1988)
Plant available sulfate in the soil is extracted using a weak calcium chloride solution. Sulfate in the extract is determined by ICP-OES. This extraction may also produce organic sulfur in the extracts when organic soils are analyzed.			
SO4-PASTE-ICP-CL	Soil	Sulphate (SO4)	CSSS CH15/EPA 6010D

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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A soil extract produced by the saturated extraction procedure is analyzed for sulfate by ICPOES.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:**Additional Information:**

INV COMMENTS INVOICE PAID IN FULL

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.